3.11 PUBLIC HEALTH AND SAFETY

This section examines potential public health and safety impacts that could be associated with the Proposed Project and alternatives, specifically, those related to: hazardous materials, fire management, and electric and magnetic fields (EMF).

3.11.1 Affected Environment

3.11.1.1 Hazardous Materials

The Proposed Project and alternatives would be located in an area that is largely open space, public and private land used for grazing, mining, agriculture and recreational activities. The project area is very sparsely populated with only a few rural ranch houses, mobile homes, and trailers near each of the transmission line route alternatives. Although the existence of hazardous materials along the alignments is possible, existing land use within the area is limited and not expected to have generated a substantial presence of hazardous materials within the alignments. Pesticide use associated with agricultural activities within certain areas along each of the alignments creates the potential for hazardous materials to be present. Additionally, certain small industrial activities within the project area may also have general hazardous materials. It is possible that historical or illegal disposal has introduced such materials to areas within the Proposed Project and alternative transmission line alignments; however, the actual presence of such materials within potential rights-of-way has not been identified.

3.11.1.2 Fire Management

Most fires in the desert are caused by lightning or vehicles. Natural fires are mostly the result of lightning strikes in the mesas, foothills, and mountain areas. Compared to other parts of the state, few fires occur within the project area, and most are relatively small. In the 15 years between 1980 and 1995, a small number of fires burned a total of about 6,000 acres. (BLM/CDFG 2001)

BLM and the National Park Service (NPS) collaborated in the development of the *Fire Management Activity Plan (FMAP), 1996, for the California Desert*. The FMAP brings together fire management goals for biological resources, wilderness, and other sources to establish fire management standards and prevention and protection programs. The FMAP includes limitations on fire suppression methods in critical habitat and other tortoise habitat. It is designed to limit habitat disturbance while keeping fires small. (BLM/CDFG 2001)

In general, fire hazards from power lines cause a small minority of wildfires in rural areas. In some areas trees or branches that fall across the conductors may release sparks that can start fires. The Proposed Project and alternative transmission line alignments are located within desert terrain with limited vegetation consisting of low lying trees and shrubs that do not extend above the electrical transmission lines. No known fires have been directly caused by transmission lines in the project area.

According to the BLM's Field Office Fire Management Plan, there are four different fire management categories (BLM/CDFG 2001). These categories are as follows:

- Category 1 - Areas where fire is not desired at all because fire doesn't play a significant positive role in the functioning of the ecosystem and fire creates a direct threat to life and property.
- Category 2 - Areas where fire is not desired, but natural burns may be permitted.
- Category 3 - Areas where fire is desired but there may be social, political, or ecological constraints that must be considered.
- Category 4 - Areas where fire is desired and there are few to no constraints to its use.

The last three categories apply to areas along the Proposed Project and alternative transmission line alignments. In general, Category 2 areas are found in the scattered agricultural lands along portions of the alignments. Categories 3 and 4 are found in local foothills and mountains along the alignments.

The Riverside County Fire Department (RCFD) and the Imperial County Fire Department (ICFD) provide fire protection services within Riverside and Imperial counties. Additional backup fire protection services may be provided by the California Department of Forestry and Fire Protection (CDF) and local fire departments, which are primarily composed of volunteers. Fire service response and response times vary depending upon the location of a fire within the area.

3.11.1.3 Electric and Magnetic Fields

This section provides a brief overview of Electric and Magnetic (EMF), discusses public health concerns associated with EMF, and presents modeled existing EMF levels at locations within the project area. EMF is a term used to collectively describe electric and magnetic fields that are created by electric voltage (electric field) and electric current (magnetic field), as discussed below.

3.11.1.3.1 Electric Fields Overview

The potential or voltage (electrical pressure) on an object causes electric fields. Any object with an electric charge on it has a voltage (potential) at its surface caused by the accumulation of more electrons on that surface as compared with another object or surface. The voltage effect is not limited to the surface of the object but exists in the space surrounding the object in diminishing intensity. Electric fields can exert a force on other electric charges at a distance. The change in voltage over distance is known as the electric field. The units describing an electric field are volts per meter (V/m) or kilovolts per meter (kV/m). This unit is a measure of the difference in electrical potential or voltage that exists between two points one meter apart. The electric field becomes stronger near a charged object and decreases with distance away from the object.

Electric power transmission lines create 60 Hertz (Hz) electric fields. These fields result from the voltage of the transmission line phase conductors with respect to the ground. Electric field strengths from a transmission line decrease with distance away from the outermost conductor, typically at a rate of approximately one divided by the distance squared ($1/d^2$). As an example, in an unperturbed field, if the electric field strength is 10-kV/m at a distance of 1 meter away, it would be approximately 2.5-kV/m at 2 meters away and 0.625-kV/m at 4 meters away. In contrast, the electric field strength from a single conductor typically decreases at a rate of approximately one divided by the distance (1/d). For example, an electric field strength of 10-kV/m at 1 meter away would decrease to approximately 5-kV/m at 2 meters away, and 2.5-kV/m at 4 meters away. Electric field strengths for a transmission line remain nearly constant over time because the voltage of the line is kept within bounds of about ±5 percent of its rated voltage. Transmission line electric fields are affected by the presence of grounded and conductive objects. Trees and buildings, for example, can significantly reduce ground level electric fields by shielding the area nearby (Deno 1987).

Electric power substations also create electric fields due to voltage on station components. The equipment, or components of a substation, acts as point-sources of an electric field, similar to appliances in a home. As the distance from these point sources becomes greater than the physical size of the equipment acting as a source, the field is greatly reduced; this is also true for substation components, such as buswork. The electric fields of station equipment (transformers, circuit breakers, etc.) decrease external to a substation at a rate of approximately one divided by the distance cubed ($1/d^3$), unless an overhead transmission line is nearby. For example, a field of 10-kV/m at 1 meter away would be approximately 1.25-kV/m at 2 meters away, and 0.156-kV/m at 4 meters away. This contrasts with the linear or line-source characteristics of transmission lines that decrease as approximately one divided by the distance squared ($1/d^2$). Substation electric fields outside the fenced equipment area are typically very low because of shielding by metallic substation components themselves, as well as by the metal fencing surrounding the substation. (Deno 1987).

3.11.1.3.2 Magnetic Fields Overview

Electric current flowing in a conductor (electric equipment, household appliance, power circuits, etc.) creates a magnetic field. A commonly used magnetic field intensity unit of measure for reporting magnetic field magnitudes is the milligauss (mG). As with electric fields, the magnetic fields from electric power facilities and appliances differ from static (or DC) fields because they are caused by the flow of 60 Hz alternating currents. Power frequency magnetic fields also reverse direction at a rate of 60 cycles per second, corresponding to the 60 Hz operating frequency of the power systems in the U.S.

In transmission lines, such as those existing in the project area and the proposed transmission line, 60-Hz magnetic fields are generated by the current flowing on the phase conductors. Similar to the electric field, field strengths decrease with distance away from the line. Unlike electric fields that vary little over time, magnetic fields are not constant over time, and vary continuously as transmission line current changes in response to increasing and decreasing electrical load.

Electric power substations also create magnetic fields due to current flow on station components. Because a substation is a collection of components that can each be a magnetic field source, a substation complex is often treated as a single point-source for external field measurements taken at a distance. External magnetic fields associated with the substation (e.g., the collection of equipment or components) can be considered separately from the magnetic fields associated with the transmission lines that serve the substation. The manner in which substation component magnetic fields attenuate with distance is similar to that of appliances, where the field strengths diminish rapidly as the distance from the source grows larger than the dimensions of the source itself (for example, a transformer). Therefore, at distances on the order of 50 feet or more from the substation fence, the external magnetic field would have decreased to a much lower level than the level inside the substation. In contrast to electric fields, the substation magnetic fields are not affected significantly (shielded) by most common objects.

3.11.1.3.3 EMF-Related Human Health Concerns

Over the past two decades, there has been significant concern over the potential for exposure to EMF to adversely affect human health. Concerns include a variety of diseases and other health effects, such as reproduction. The possible effect of EMF on human health was originally focused on electric fields; however, much of the recent research has focused on magnetic fields.

Some of these studies have generally found no conclusive evidence of harmful effects from typical transmission line and substation electric and magnetic fields. However, some studies have reported a potential for harmful effects to humans. Complicating resolution of this issue is the lack of knowledge as to what characteristics of electric and magnetic field exposure (if any) need to be considered to assess human exposure effects. The exposure most often considered is intensity or magnitude of the field.

There is a consensus among the medical and scientific communities that there is insufficient evidence to conclude that EMF causes adverse health effects. Neither the medical nor scientific communities have been able to provide any foundation upon which federal or state regulatory bodies could establish a standard or limit for exposure that is known to be either safe or harmful.

3.11.1.3.4 Existing Electric and Magnetic Field Levels

Existing electric and magnetic fields at various locations within the project area (with varying existing transmission line configurations) were estimated using the modeling methodology described below in Section 3.11.3.1.4. Locations of the configurations modeled are indicated on Figure 3.11-1. Table 3.11-1 lists the various transmission line configurations at each of these locations. Existing modeled electric and magnetic field levels are presented graphically in Sections 3.11.2.2 through 3.11.2.4. Due to a lack of evidence that electric or magnetic fields at levels similar to those identified for existing conditions can cause public health effects and due to the limited extended human exposure that occurs in these areas, existing electric and magnetic field levels are not expected to pose a human health hazard.

Figure 3.11-1
EMF Modeling Locations

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Table 3.11-1
Existing Transmission Line Configurations at EMF Modeling Locations

Location	Existing Transmission Line Configurations
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV
2	SCE 500-kV
3	SCE 500-kV, MWD 161-kV
4	SCE 500-kV, MWD 161-kV, IID KN-KS 230-kV
5	SCE 500-kV, IID KN-KS 230-kV
6	WAPA 161-kV
7	Distribution Line
8	F Line 161-kV

3.11.2 Regulatory Setting

3.11.2.1 Hazardous Materials Laws and Regulations

Use, storage, and disposal of hazardous materials are regulated by numerous local, state, and federal laws. Existing laws that IID would be required to comply with for the Proposed Project include, but are not limited to, local emergency planning laws and programs; U.S. DOT regulations related to the transport of hazardous substances; the Resource Conservation and Recovery Act (RCRA) which provides for the regulation of use and disposal of hazardous wastes; the Toxic Substances Control Act which provides for regulation of the production, use, sale and other distribution of potentially hazardous chemicals including polychlorinated biphenyls (PCBs); the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) which provide liability requirements for contaminated sites as well as use and spill notification requirements; the Emergency Planning and Community Right-to-Know Act which requires certain manufacturing facilities to file annual reports with the U.S.EPA that identify their use and release of one or more listed toxic chemicals and provides for a network of state and local emergency planning committees to facilitate planning of emergency response plans; the CWA which includes enforcement of discharge limitations through the NPDES; CAA which comprises several coordinated programs that address air pollution and sources; BLM W.O. IM-93-344; and 40 CFR 260-302.

3.11.2.2 Fire Management Laws and Regulations

The Proposed Project and alternatives would be subject to state, county, and federally enforced laws, ordinances, rules, and regulations that pertain to prevention and suppression of fire activities. Such requirements include, but may not be limited to, preparation of a Fire Prevention and Suppression Plan pursuant to BLM and other jurisdictional agency requirements, design specifications of the NESC, and IID standard fire monitoring and emergency response requirements.

3.11.2.3 EMF and Transmission Line Electric Safety Guidelines and Regulations

Although California legislation has not adopted regulatory limits associated with high-voltage transmission line EMF levels, a number of other states have developed standards or guidelines associated with electric or magnetic fields. In addition, other organizations have established field exposure standards or guidelines. Existing EMF guidelines or limits are summarized in **Tables 3.11-2** through **3.11-4**. There are no state regulations that specifically apply to EMF levels associated with the Proposed Project. NESC requirements limit induced currents (discussed in more detail in Health and Safety Impact 7, below) on objects to five mA or less.

Table 3.11-2
States and Regulations For Transmission Line Fields

State	Field Limit
Montana	1-kV/m at edge of right-of-way (in residential areas)
Minnesota	8-kV/m maximum on right-of-way
New Jersey	W/m at edge of right-of-way
New York	1.6-kV/m at edge of right-of-way
	200 mG at edge of right-of-way
North Dakota	9-kV/m maximum on right-of-way
Oregon	9-kV/m maximum on right-of-way
Florida	10-kV/m for 500-kV Lines- maximum on right-of-way
	2-kV/m for 500-kV Lines- at edge of right-of-way
	8-kV/m for 230-kV and smaller Lines- maximum on right-of-way
	2-kV/m for 230-kV and smaller Lines- at edge of right-of-way
	200 mG for 500-kV Lines- at edge of right-of-way
	250 mG for double circuit 500-kV Lines- at edge of right-of-way
	150 mG for 230-kV and smaller Lines- at edge of right-of-way

Source: Office of Technology (OTA) 1989.

Table 3.11-3
American Conference Of Governmental Industrial Hygienists Occupational Threshold Limit Values For 60-Hz EMF

Electric Field	Magnetic Field
Occupational exposures should not exceed:	**Occupational exposures should not exceed:**
25-kV/m (from 0 Hz to 100 Hz) Prudence dictates the use of protective devices (e.g. suits, gloves, insulation) in fields above 15-kV/m. For workers with cardiac pacemakers or similar medical electronic devices, maintain exposure at or below 1-kV/m (1,000 V/m).	10 G (10,00 mG) For workers with cardiac pacemakers or similar medical electronic devices, maintain exposure at or below one G (1,000 mG).

Source: American Conference of Governmental Industrial Hygienists (ACGIH) 1999

Table 3.11-4
International Commission On Non-Ionizing Radiation Protection (ICNIRP)

Exposure (60 Hz)	Electric Field	Magnetic Field
Occupational:		
Reference Levels for Time-Varying Fields	8.333-kV/m (8,333 V/m)	4.167 G (4,167 mG)
Current Density for Head and Body	10 mA/m^2 (25-kV/m)	10 mA/m^2 (5 G)
General Public:		
Reference Levels for Time-Varying Fields	4.167-kV/m (4,167 V/m)	0.833 G (833 mG)
Current Density for Head and Body	2 mA/m^2 (5-kV/m)	2 mA/m^2 (1 G)

Source: ICNIRP 1998

3.11.3 Environmental Consequences

The following sections present potential health and safety impacts associated with the Proposed Project and alternatives. First discussed is the methodology used to identify potential impacts and criteria used for determining impact significance. Public health and safety impacts associated with the Proposed Project are then presented in Section 3.11.3.2, followed by a comparative discussion of potential impacts of Alternative A, Alternative B, Alternative C, and the No Project Alternative.

3.11.3.1 Methodology and Significance Criteria

The public health and safety analysis was conducted to determine potential increases in threat or risk of the safety and/or health of populations within the project area. In general, the Proposed Project or alternatives were considered to have a significant public health and safety impact if construction and or operation would:

- Interfere with adopted emergency response plans or emergency evacuation plans.
- Create a substantial public health hazard.

Specific consideration of potential impacts associated with the use of hazardous materials; fire management; and the EMF and other aspects of operation of a high voltage electrical transmission line were considered, as discussed below.

3.11.3.1.1 Hazardous Materials

The methodology for analyzing impacts included identifying general types of hazardous materials and techniques that are likely to be used during Proposed Project construction, operation, and maintenance. Potential impacts associated with hazardous materials were considered significant if the Proposed Project or alternatives would involve the use or disposal of hazardous materials in a manner that would pose a substantial hazard to people or the environment.

3.11.3.1.2 Fire Management

To determine potential impacts associated with fire management, activities and equipment that could pose fire hazards were evaluated. Fire management impacts would be considered significant if the Proposed Project or alternatives would create a substantial increase in fire ignition potential.

3.11.3.1.3 Electric and Magnetic Fields

Estimates of existing and future-with-project electric and magnetic field values at select locations along the Proposed Project and alternative transmission line alignments were calculated using computer-modeling software. Transmission line configuration information and other parameters were entered into the program to develop modeled electric and magnetic field levels. Software was used to calculate the power frequency electric field and magnetic fields at selected locations and associated transmission line configurations. Because ground clearances and span lengths would vary throughout the length of the transmission lines, the minimum conductor ground clearance was assumed for each transmission line configuration modeled. For electric field modeling, a computer program originally developed by the SCE was used to perform the field calculations. For magnetic field modeling, a computer program originally developed by the Bonneville Power Administration (BPA) was used to perform the field calculations (BPA 1977). Typically, the computer model calculates magnetic field values to within +/- 5 percent of actual field measurements; however, field measurements were not conducted for this analysis.

For the purposes of this analysis, extended exposure of the general public to Proposed Project-related electric or magnetic fields that exceed levels established by the American Conference of Governmental Industrial Hygienists (1999) or the International Commission on Non-Ionizing Radiation Protection (1998), as identified in Section 3.11.2.4, would be considered a potentially significant impact. In addition, exposure of objects to induced currents of greater than five mA would be considered a significant impact.

3.11.3.2 Proposed Project Impacts and Mitigation Measures

The following section identifies potential public health and safety impacts for the Proposed Project.

Health and Safety Impact 1: *Use of hazardous materials for construction, operation and maintenance of the Proposed Project would create potential exposure for workers and the public.*

Use of hazardous materials during Proposed Project construction, operation, and maintenance would pose potential health and safety hazards to construction and maintenance workers and nearby residents. These impacts would be associated with blasting during tower installation, use of hazardous substances during construction and maintenance activities, and the potential for spills. **Table 3.11-5** lists the hazardous materials that are typically used for transmission line projects.

Detailed information about the use, storage and disposal of hazardous materials would be provided in the COM Plan that would be submitted to BLM. The COM Plan would define specific procedures for vehicle refueling and servicing, transportation and storage of hazardous materials, and disposal of hazardous wastes. For example, construction vehicles and equipment would be required to be serviced and fueled at least 100 feet from sensitive areas.

Table 3.11-5
List of Hazardous Materials Typically Used for Transmission Line Construction

2-cycle oil (contains distillates and hydrotreated heavy paraffinic)	Acetylene gas
ABC fire extinguisher	Ammonium hydroxide
Air tool oil	Battery acid (in vehicles and in the meter house of the substations)
Automatic transmission fluid	Insect killer
Canned spray paint	Chain lubricant (contains methylene chloride)
Diesel de-icer	Connector grease (penotox)
Explosives (detonators, detonator assemblies – non-electric, tubular primers, cap-type primers, ammonium nitrate fertilizers)	Contact cleaner 2000
Eye glass cleaner (contains methylene chloride)	Diesel fuel additive
Gasoline	Gasoline treatment
Hot stick cleaner (cloth treated with polydimethylsiloxane)	Lubricating grease
Insulating oil (inhibited, non-PCB)	Methyl alcohol
Mastic coating	Paint thinner
Wasp and hornet spray (1,1,1 trichloroethene)	Antifreeze
Bottled oxygen	Puncture seal tire inflator
Petroleum products (gasoline, diesel fuel, jet fuel A, lubricants, brake fluid, hydraulic fluid)	Starter fluid
Propane	WD-40
Safety fuses	ZIP (1,1,1-Tricholorethane)
Sulfur hexaflouride (within the circuit breakers in the substations)	Brake fluid
ZEP (safety solvent)	

Procedures would be outlined to minimize the chance of a fuel spill during servicing and refueling. Vehicles would be required to carry absorbent material to handle potential spills, inspected for fuel leaks regularly, and equipped with fire fighting equipment. Hazardous materials would be transported in U.S. DOT approved containers and allowed only on approved access roads. Vehicles carrying hazardous materials would be equipped with appropriate materials to contain a small spill should one occur during transport. Vehicles and storage containers would be properly signed/marked and inspected for leakage and other potential safety problems prior to transportation.

Hazardous materials would be stored in proper containers in material yards and designated construction areas. Cleanup materials would be stored in these areas. Hazardous wastes, including used oil, used oil filters, used gasoline containers, spent batteries, and other items, would be collected regularly and disposed of in accordance with all applicable laws. Every effort would be made to minimize the production of hazardous waste during the Proposed Project, such as using non-hazardous substances when available, minimizing the amount of hazardous materials used for the Proposed Project, and recycling and filtering hazardous materials.

A road sealant would be used to suppress dust along access roads during construction. The specific type of sealant to be used has not yet been determined; however, environmentally safe road sealants are available from various sources as an agricultural by-product or in the form of a polymer specifically used to control dust. These products have been successfully utilized on transmission line construction projects to control dust on access roads used for construction. The materials are applied at the average rate of 250 gallons per acre in a mixture diluted two to one with water. The materials are non-toxic. Construction contractors would be required to submit Materials Safety Data Sheets (MSDS) for these materials as part of the Access Road Plan.

IID would be required to maintain MSDS and U.S. DOT Emergency Response Guidebook at material yards, construction sites, substations, and in construction and maintenance crew vehicles. IID would also be required to complete an SF 299 Section 19 Hazardous Materials List and prepare and submit for approval a Blasting Plan and COM Plan that would contain information concerning actions to be taken in the event of a hazardous materials or petroleum product spill (in addition to a Fire Prevention and Response Plan [FPRP]). These plans, along with the U.S. DOT Emergency Response Guidebook, would adequately control the use, production, transportation, and storage of hazardous materials along the transmission line corridor, access roads, material yards, and substations. In addition, IID is prohibited by law from treating or disposing of any hazardous materials outside of an approved treatment or disposal site. Proper implementation of the COM Plan would be expected to result in less-than-significant impacts from hazardous materials.

The FPRP and Blasting Plan would be included in the COM Plan as well. Also, as part of its standard operating procedures, IID would develop a health and safety plan with procedures for emergencies and coordination with local hospitals and public safety officials. The transmission line would not block use of paved roadways, and thus, is not expected to interfere with adopted emergency response plans or emergency evacuation plans.

Health and Safety Impact 2: *Construction activities would generate solid wastes requiring disposal.*

During construction non-hazardous solid wastes would be produced that would require disposal (see Health and Safety Impact 1 for a discussion of hazardous waste use and disposal). This construction debris would be hauled and disposed at appropriate handling facilities to be identified and listed in the COM Plan prior to the initiation of construction activities. Such waste generation and disposal would not pose a significant impact to public health and safety.

Health and Safety Impact 3: *Activities associated with construction, operation and maintenance of the Proposed Project would increase potential for accidental fire ignition.*

Construction, operation, and maintenance of the Proposed Project could increase the potential for a fire in the project area. Workers smoking cigarettes, sparks from equipment, or other activities could increase potential for fire ignition. The potential for fire hazards is considered a significant impact that could be mitigated to less-than-significant levels by implementation of the following mitigation measures.

Health and Safety Impact 3 Mitigation: *IID would implement a FPRP during construction, operation, and maintenance of the proposed transmission line. A detailed plan would be prepared as part of the COM Plan. A preliminary outline of the FPRP is provided with this*

EIS/EIR as Appendix H, and includes some of the basic practices and techniques that would be included in the final FPRP, and used to minimize fire hazards associated with the Proposed Project.

Health and Safety Impact 4: *Transportation and use of materials necessary for potential blasting could create an increased risk of injury to workers and the public.*

Although the need for blasting during construction is not anticipated, in the event that blasting were to become necessary in limited instances, the transportation, storage and use of explosives could create increased risk of injury to construction workers and the public. Any and all explosives necessary for construction activities would be transported by a licensed contractor who would ensure compliance with State of California Safety Orders (Cal-OSHA) Article 8, Section 1564 and California Vehicle Code, Division 14 requirements for vehicle transportation of explosives on public roadways. All blasting would be conducted by a contractor with a valid California “Blaster License” pursuant to Cal-OSHA Article 8, Section 1550-1580. Such handling and adherence to regulatory requirements would reduce the potential for worker and public injury to less-than-significant levels, and no additional mitigation is necessary.

Health and Safety Impact 5: *The energized transmission line would increase potential for accidental fire ignition.*

An energized transmission line can create a fire hazard if 1) a conducting object comes into proximity to the transmission line, resulting in a flashover to ground, and 2) if an energized phase conductor were to fall to the ground and remain in contact with combustible material long enough to heat this material and cause a fire. The mechanical and structural design, selection of materials, and construction of transmission lines take into account normal and unusual structural loads, such as ice and wind, which could cause the phase conductors to break. It is theoretically possible that an energized phase conductor could cause a fire if it were to fall to the ground and create an electrical arc that can ignite combustible material; however, this is a very unlikely event. If an energized phase conductor were to fall to the ground and create a line-ground fault, high-speed relay equipment is designed to sense that condition and actuate circuit breakers that can de-energize the transmission line in less than about one-tenth of a second. This procedure has proven to be a reliable safety measure and reduces the risk of fire from high voltage transmission lines to a low level.

If a vehicle were refueled under a high-voltage transmission line, a possible safety concern could be the potential for accidental fuel ignition. The source of fuel ignition could be a spark discharge into fuel vapors collected in the filling tube near the top of the gas tank. The spark discharge would be due to current induced in a vehicle (insulated from ground) by the electric field of the transmission line and discharged to the ground through a metallic refueling container held by a well-grounded person.

Theoretical calculations show that if a number of unlikely conditions exist simultaneously, a spark could release enough energy to ignite gasoline vapors (EPRI 1982: 381). This could not occur if a vehicle were simply driven or parked under a transmission line. Rather, several specific conditions would need to be satisfied: large gasoline-powered vehicle would have to be parked in an electric field of about 5-kV/m or greater (Deno and Silva 1985); a person would have to be refueling the vehicle while standing on damp earth and while the vehicle is on insulating dry asphalt or gravel; the fuel vapors and air would have to mix in an optimum proportion; and finally, the pouring spout must be metallic. The chances of having all the conditions necessary for fuel ignition present at the same time are extremely small. Very large vehicles (necessary to collect larger amounts of electric charge) are often diesel-powered, and diesel fuel is less volatile and more difficult to ignite. Both the 230-kV and 500-kV transmission line options would result in electric field levels that are too low (<3.6-kV/m on the right-of-way) for the minimum energy necessary for fuel ignition under any practical circumstances.

IID also would outline its standard fire monitoring and emergency response procedures in the COM Plan, including protocols for notifying local fire protection agencies. Thus, fire hazards from the transmission line would be considered adverse but not significant.

Health and Safety Impact 6: *Substation equipment and the energized transmission line could increase EMF levels within and in areas immediately adjacent to the right-of-way.*

As discussed, five locations along the Proposed Project transmission line were selected and modeled to estimate existing and with-project electric and magnetic field levels. The locations modeled are indicated as locations 1, 2, 3, 4, and 5 on Figure 3.11-1. Table 3.11-6 provides the transmission line configurations that would be present at these locations with the Proposed Project in place. Figures 3.11-2 through 3.11-11 provide the electric and magnetic field modeling results for existing conditions and with-Proposed Project conditions (for the 230-kV option and the 500-kV option) at each of these locations.

Table 3.11-6
Transmission Line Configurations at
EMF Modeling Locations for the Proposed Project

Location	Transmission Line Configurations with CDSWTP Line
230-kV Configuration Option	
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV, Proposed Project 230-kV
2	SCE 500-kV, Proposed Project 230-kV
3	SCE 500-kV, MWD 161-kV, Proposed Project 230-kV
4	SCE 500-kV, MWD 161-kV, IID KN-KS 230-kV, Proposed Project 230-kV
5	SCE 500-kV, IID KN-KS 230-kV, Proposed Project 230-kV
500-kV Configuration Option	
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV, Proposed Project 500-kV
2	SCE 500-kV, Proposed Project 500-kV
3	SCE 500-kV, MWD 161-kV, Proposed Project 500-kV
4	SCE 500-kV, MWD 161-kV, IID KN-KS 230-kV, Proposed Project 500-kV
5	SCE 500-kV, IID KN-KS 230-kV, Proposed Project 500-kV

Figure 3.11-2
Modeled Electric Field Levels at Location 1

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Figure 3.11-3
Modeled Magnetic Field Levels at Location 1

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Figure 3.11-4
Modeled Electric Field Levels at Location 2

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Figure 3.11-5
Modeled Magnetic Field Levels at Location 2

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Figure 3.11-6
Modeled Electric Field Levels at Location 3

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Figure 3.11-7
Modeled Magnetic Field Levels at Location 3

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Figure 3.11-8
Modeled Electric Field Levels at Location 4

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Figure 3.11-9
Modeled Magnetic Field Levels at Location 4

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Figure 3.11-10
Modeled Electric Field Levels at Location 5

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Figure 3.11-11
Modeled Magnetic Field Levels at Location 5

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As shown in Figures 3.11-2 through 3.11-11, increases in electric and magnetic fields that would occur as a result of the Proposed Project would be greatly reduced within 300 feet of the centerline. Because no residences or other areas of activity with long-term exposure potential occur within this distance, the impact of increased EMF levels associated with the Proposed Project transmission line would be less than significant.

The electric field from substation equipment and buswork are typically shielded by the surrounding equipment, supporting structures, substation fence, and other nearby objects. The dominant sources of electric fields near a substation are typically the overhead electrical transmission lines that enter and exit the substation. For the Proposed Project, the new substation/switching on Hobsonway and the addition of new transformers, buswork, circuit breakers, and other internal electrical equipment at the Devers Substation is not expected to significantly increase electric field levels outside of the substation perimeters.

Health and Safety Impact 7: *Energized transmission line would create risk of electric shock within the transmission line right-of-way.*

Electric currents can be induced by electric and magnetic fields in conductive objects near to transmission lines. The majority of concern is about the potential for small electric currents to be induced by electric fields in metallic objects close to transmission lines. Metallic roofs, vehicles, vineyard trellises, and fences are examples of objects that can develop a small electric charge in proximity to high voltage transmission lines. Object characteristics, degree of grounding, and electric field strength affect the amount of induced charge. An electric current can flow when an object has an induced charge and a path to ground is presented. The amount of current flow is determined by the impedance of the object to the ground and the voltage induced between the object and the ground. Induced current can create the potential for nuisance shocks to people and the possibility of other effects, such as fuel ignition.

Induced currents can be calculated for common objects for a set of theoretical (worst-case) assumptions: the object is perfectly insulated from the ground, located in the highest field, and touched by a perfectly grounded person. The maximum electric field would occur within a small portion of the right-of-way, and perfect insulation and grounding states are not common. For these assumptions the calculated induced current values for the objects presented in **Table 3.11-7** are below hazardous levels (i.e., where a person could not let go of an object: nine mA for men and six mA for women), and the transmission line would comply with the NESC requirements limiting induced currents on objects to five mA or less, and would be less than significant.

Long wire or metallic fences parallel to a transmission line can present an induced current situation, especially if the fence posts are non-metallic and insulate wires from the ground. In such instances, the potential for shock can be reduced or eliminated through frequently grounding the fence using a ground rod connected to the fencing wire. During Proposed Project construction, metallic fences that parallel the transmission line for more than 500 feet and are located within 155 feet of the centerline would be grounded, thereby reducing the potential for induced current electric shock associated with metallic fences to less than significant levels.

Table 3.11-7
Calculated Induced Current for Objects
Near Transmission Line for Theoretical Conditions

Object	Length	Induced Current	Induced Current (mA)	
		Coefficient – mA/kV/m	Near Midspan	Right-of-way edge
230-kV Transmission Line				
Pickup Truck	17 ft.	0.07	0.08	0.02
Farm Tractor &/Wagon	31 ft.	0.21	0.23	0.05
Combine	30 ft.	0.25	0.28	0.06
School Bus	34 ft.	0.26	0.29	0.06
Tractor-trailer	52 ft.	0.43	0.47	0.10
500-kV Transmission Line				
Pickup Truck	17 ft.	0.07	0.20	0.03
Farm Tractor &/Wagon	31 ft.	0.21	0.61	0.11
Combine	30 ft.	0.25	0.73	0.13
School Bus	34 ft.	0.26	0.75	0.13
Tractor-trailer	52 ft.	0.43	1.25	0.22

Limited agricultural operations occur within or near the Proposed Project transmission line right-of-way. Irrigation systems often incorporate long runs of metallic pipes that can be subject to field induction when located parallel and close to transmission lines. Because the irrigation pipes contact moist soil, electric field induction is generally negligible; however, annoying currents could still be experienced from electric field coupling to the pipe. Pipe runs laid at right angles to the transmission line would minimize induced currents, although such a layout may not always be feasible. Induction problems can be reduced by grounding and/or insulating the pipe runs. Operation of irrigation systems beneath transmission lines presents another safety concern. If the system uses a high-pressure nozzle to project a stream of water, the water may make contact with the energized transmission line conductor. Generally, the water stream consists of solid and broken portions. If the solid stream contacts an energized conductor, an electric current could flow down the water stream to someone contacting the high-pressure nozzle. Transmission line contact by the broken-up part of the water stream is unlikely to present any hazard. Health and Safety Impact 7 Mitigation would reduce this potential impact to less than significant.

Health and Safety Impact 7 Mitigation: *Prior to energizing the Proposed Project transmission line, IID would consult with managers of agricultural land within the transmission line right-of-way to ensure that irrigation practices would not create a potential for water stream contact with overhead transmission lines. This mitigation measure would reduce Health and Safety Impact 7 to less than significant.*

Health and Safety Impact 8: *Energized transmission line would create potential disruption to pacemaker operation within and immediately adjacent to transmission line right-of-way.*

Electric and magnetic fields could create interference with certain cardiac pacemakers, causing them to switch from a normal full function pacing mode to an "asynchronous" fixed-pace mode.

Some new pacemaker models can be more sensitive to external interference, while other models appear unaffected.

There are two general types of pacemakers: asynchronous and synchronous (IITRI 1979). The asynchronous pacemaker pulses at a predetermined rate. It is practically immune to interference because it has no sensing circuitry and is not exceptionally complex. The synchronous pacemaker, on the other hand, pulses only when its sensing circuitry determines that pacing is necessary. The concern is that interference could result from transmission line electric or magnetic fields, and cause a spurious signal in the pacemaker's sensing circuitry (Sastre 1997). However, when these pacemakers detect a spurious signal, such as an induced 60 Hz current, they are programmed to revert to an asynchronous or fixed pacing mode of operation and return to synchronous operation within a specified time after the signal is no longer detected.

The potential for pacemaker interference due to high voltage transmission line fields depends on the manufacturer, model, and implantation method, among other factors. Studies have determined thresholds for interference of the most sensitive units to be about 2,000 to 12,000 mG for magnetic fields and about 1.5 to 2.0-kV/m for electric fields (University of Rochester 1985). The electric and magnetic fields at the edge of the Proposed Project transmission line right-of-way would be below these values; however, within the right-of-way the electric field threshold could be exceeded. The electric fields on the right-of-way would also be above the limit value of 1-kV/m suggested for occupational exposure to electric fields (ACGIH 1999). It is unclear that reversion to a fixed pacing mode is harmful since pacemakers are routinely put into reversion with a magnet to test operation and battery life. Some new pacemaker models are dual chamber devices that can be more sensitive to external interference. Some of these dual chamber units may experience inappropriate pacing behavior (prior to reversion to fixed pacing mode) in electric fields as low as 1.2-2-kV/m, while other models appear unaffected in fields up to 20-kV/m.

The biological consequences of brief, reversible pacemaker malfunction are mostly benign. An exception would be an individual who has a sensitive pacer and is completely dependent on it for maintaining all cardiac rhythms. For such an individual, a malfunction that compromised pacemaker output or prevented the unit from reverting to the fixed pacing mode, even brief periods of interference, could be life-threatening (Sastre 1997:8-2). The precise coincidence of events (i.e., pacer model, field characteristics, and biological need for full function pacing) would generally appear to be a rare event.

3.11.3.3 Alternative A Impacts and Mitigation

Impacts associated with hazardous materials, fire management, electric shock and pacemaker function under Alternative A would be similar to those identified in Proposed Project Impacts 1, 2, 3, 4, 5, 6, 7 and 8, above. All mitigation measures identified for these impacts under the Proposed Project would also be required for Alternative A, and would serve to reduce potential Alternative A impacts to less than significant. Impacts associated with electric and magnetic fields would also be similar to those identified for the Proposed Project (see Health and Safety Impact 8, above).

3.11.3.4 Alternative B Impacts and Mitigation

Impacts associated with hazardous materials, fire management, electric shock and pacemaker function under Alternative B would be similar to those identified in Proposed Project Impacts 1, 2, 3, 4, 5, 6, 7 and 8, above. Mitigation measures identified for these impacts under the Proposed Project would also be required for Alternative B, and would serve to reduce potential Alternative B impacts to less than significant. Impacts associated with electric and magnetic fields would also be similar to those identified for the Proposed Project (see Health and Safety Impact 6, above); however, due to variations in configurations associated with the Alternative B alignment, estimates of electric and magnetic fields at certain locations along the Alternative B transmission line alignment have been calculated and are presented in Health and Safety Impact B1, below.

Health and Safety Impact B1: *Substation equipment and the energized transmission line could increase EMF levels within and in areas immediately adjacent to right-of-way.*

Four locations along the Alternative B transmission line were selected and modeled to estimate existing and with-project electric and magnetic field levels. The locations modeled are indicated as 1 (also applicable to the Proposed Project), 6, 7, and 8 on Figure 3.11-1. Table 3.11-8 provides the transmission line configurations that would be present at these locations with Alternative B in place. Figures 3.11-12 through 3.11-17 provide the electric and magnetic field modeling results for existing conditions and with-Proposed Project conditions at each of these locations (with the exception of location 1, which is presented above in Proposed Project Impact 6, as it applies to the Proposed Project and each transmission line alternatives).

Table 3.11-8
Transmission Line Configurations at
EMF Modeling Locations for Alternative B

Location	Transmission Line Configurations with CDSWTP Line
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV, Alternative B 230-kV
6	WAPA 161-kV, Alternative B 230-kV
7	Distribution Line, Alternative B 230-kV
8	F Line 161-kV, Alternative B 230-kV

As shown in Figures 3.11-12 through 3.11-17, increased electric and magnetic fields that would occur as a result of Alternative B, would be greatly reduced within 300 feet of the centerline. Because no residences or other areas of activity with long-term exposure potential occur within this distance, the impact of increased EMF levels associated with the Alternative B transmission line would be less than significant. Impacts associated with electric field increases at the substations would be the same as identified for the Proposed Project and would be less than significant.

Figure 3.11-12
Modeled Electric Field Levels at Location 6

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Figure 3.11-13
Modeled Magnetic Field Levels at Location 6

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Figure 3.11-14
Modeled Electric Field Levels at Location 7

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Figure 3.11-15
Modeled Magnetic Field Levels at Location 7

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Figure 3.11-16
Modeled Electric Field Levels at Location 8

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Figure 3.11-17
Modeled Magnetic Field Levels at Location 8

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3.11.3.5 Alternative C Impacts and Mitigation

Impacts associated with hazardous materials, fire management, electric shock and pacemaker function under Alternative C would be similar to those identified in Proposed Project Impacts 1, 2, 3, 4, 5, 6, 7 and 8, above. All mitigation measures identified for these impacts under the Proposed Project would also be required for Alternative C, and would serve to reduce potential Alternative C impacts to less than significant. Impacts associated with electric and magnetic fields would also be similar to those identified for the Proposed Project (see Health and Safety Impact 8, above); however, due to variations in configurations associated with the Alternative C alignment, estimates of electric and magnetic fields at certain locations along the Alternative C transmission line alignment have been calculated and are presented in Health and Safety Impact C1, below.

Health and Safety Impact C1: *Substation equipment and the energized transmission line could increase EMF levels within and in areas immediately adjacent to right-of-way.*

Five locations along the Alternative C transmission line were selected and modeled to estimate existing and with-project electric and magnetic field levels. The locations modeled are indicated as 1, 3, 4, and 5 on Figure 3.11-1. Table 3.11-9 provides the transmission line configurations that would be present at these locations with Alternative C in place. Figures 3.11-2, 3.11-3, and 3.11-6 through 3.11-11, above, provide the electric and magnetic field modeling results for existing conditions and with-project conditions.

Table 3.11-9
Transmission Line Configurations at EMF Modeling Locations for Alternative C

Location	Transmission Line Configurations with CDSWTP Line
230-kV Configuration	
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV, Alternative C 230-kV
3	SCE 500-kV, MWD 161-kV, Alternative C 230-kV
4	SCE 500-kV, MWD 161-kV, IID KN-KS 230-kV, Alternative C 230-kV
5	SCE 500-kV, IID KN-KS 230-kV, Alternative C 230-kV
500-kV Configuration	
1	WAPA 161-kV, F Line 161-kV, SCE 161-kV, Alternative C 500-kV
3	SCE 500-kV, MWD 161-kV, Alternative C 500-kV
4	SCE 500-kV, MWD 161-kV, IID KN-KS 500-kV, Alternative C 500-kV
5	SCE 500-kV, IID KN-KS 230-kV, Alternative C 500-kV

As with the Proposed Project, increased electric and magnetic fields that would occur as a result of Alternative C, would be greatly reduced within 300 feet of the centerline. Because no residences or other areas of activity with long-term exposure potential occur within this distance, the impact of increased EMF levels associated with the Alternative C transmission line would be less than significant. Impacts associated with electric field increases at the substations would be the same as identified for the Proposed Project and would be less than significant.

3.11.3.6 No Project Alternative

Under the No Project Alternative, potential public health and safety impacts associated with the Proposed Project and Alternatives A, B, and C would not occur.

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